OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JULY:—

July 2. 11h. 7m. Minimum of Algol (β Persei).
6. 13h. Conjunction of Jupiter and Moon. Jupiter 1° 49′ N.
9. 13h. 24m. to 13h. 44m. Moon occults 71 Tauri (mag. 4·6).
,, 14h. 5m. to 14h. 58m. Moon occults θ^1 Tauri (mag. 3·9).
,, 14h. 12m. to 15h. 0m. Moon occults θ^2 Tauri (mag. 3·6)
,, 17h. 31m. to 18h. 24m. Moon occults α Tauri (mag. 1·1).
11. 11h. 34m. to 13h. 28m. Transit of Jupiter's Sat. III. (Ganymede).
15. Venus. Illuminated portion of disc=0·999, of Mars =0·995.
18. 15h. 41m. Transit (ingress) of Jupiter's Sat. III. (Ganymede).
25. 9h. 38m. Minimum of Algol (β Persei).
27. Ceres stationary 3½° S. of α Scorpii (Antares).
28. Saturn. Major axis outer ring=43″·33. Minor axis =10″·87.
28–30. Epoch of Aquarid meteoric shower (Radiant 339° − 11°).

SMITHSONIAN INSTITUTION 1900 ECLIPSE RESULTS.—No. 1439 of the *Publications* of the Smithsonian Institution is devoted to a splendidly illustrated account of the equipment and work of the expedition sent out by the Astrophysical Observatory, under the superintendence of Prof. Langley, to observe the total solar eclipse of May, 1900.

In chapter i. the director, who was aided throughout by Mr. C. G. Abbot, gives a concise account of the objects of, and the preparations for, the expedition. Chapter ii. describes the establishment of the eclipse camp at Wadesboro, North Carolina, on the same field as the Yerkes expedition under Prof. Hale.

The loan of a 12-inch lens of 135 feet focal length by Prof. Pickering made the photography of the inner corona one of the most important objects. In summarising the results in chapter iii., Prof. Langley notes, among other things, that large prominences were observed, and appeared to be associated with regions of coronal disturbance. Bolometric observations of the inner corona showed that the heating power of its radiations was unexpectedly small. The search for an intramercurial planet was made with a camera of 3 inches aperture and 11 feet focus, and several suspicious images appeared on the plate, but as there was no confirmatory second photograph the results were inconclusive. Prof. Langley recommends a similar instrument for future observers.

The twenty-two beautiful plates which accompany the report display photographs of the observers and their instruments as erected, the corona, and parts of the inner corona.

THE ORBIT OF THE COMPANION TO SIRIUS.—From a discussion of numerous observations of its position angle and distance, Herr O. Lohse, of Potsdam, has determined the following elements (for 1900·0) for the orbit of the small companion to Sirius:—

T = 1894·337 (1844·956)	Ω = 44°·12
U = 50·381	i = 39°·91
n = −7°·14559	ω = 212°·20
e = 0·598	a = 7″·427

A comparison of the observed places with those calculated from the elements, for various dates since 1862, shows that the elements are fairly correct, the mean error in position angle being generally less than 1°, and in distance less than 0″·2.

An ephemeris, for the years 1900–1912 inclusive, calculated from these elements, gives the position angle at the commencement of the present year as 116°·2, and the distance as 6″·6. Observations made at Yerkes on October 19 and 26, 1903, gave 115°·97, 6″·31, and 115°·06, 6″·33, as the respective position angles and distances for those dates (*Astronomische Nachrichten*, No. 3955).

OBSERVATIONS OF JUPITER DURING 1903.—The results of numerous observations of Jupiter which were made at Juvisy during 1903 are published and discussed by MM. Flammarion and Benoit in the *Bulletin de la Société astronomique de France* for June. From these observations, which agree with those of other observers, it appears that the northern equatorial band progressively diminished during 1903, appearing to condense towards the southern edge. The southern equatorial band appeared to be the centre of great activity, the great red spot forming a marked depression in the band, although not so sharply defined as in past years.

Several large bright spots appeared in the southern tropical zone, two of which, situated in longitudes 180° and 225° respectively, were remarkable. In the southern temperate zone several small white spots were observed which seemed to detach from the southern temperate band a quantity of the material of which the latter is composed. Summarising the observed phenomena, it is obvious that the southern hemisphere of Jupiter is in an active state of disturbance, whilst the northern hemisphere is remarkably quiescent.

OBSERVATIONS OF THE SATELLITES OF SATURN.—In the *Bulletin de la Société astronomique de France* for June, M. Lucien Rudaux publishes the results of a series of observations of five of Saturn's satellites made by him during the years 1892–7 and 1901–3 at his observatory at Donville (Manche).

His particular object was to record the changes in the brightness of each satellite, and from his numerous observations he concludes (1) that the satellites have periods of rotation equal to their respective periods of revolution; (2) that they (especially Japetus) have dark spots, probably permanent configurations, which cause a decrease in the satellite's apparent magnitude when presented to us; (3) consequently the apparent magnitude of each satellite varies periodically with the satellite's position in its orbit. These conclusions are certainly justified by the observations of Titan and Japetus, but in the case of Rhea the result is as yet uncertain.

THE GERMAN ROYAL NAVAL OBSERVATORY.—A quarto volume published by the German Naval Observatory under the general title "Aus dem Archiv der deutschen Seewarte" (twenty-sixth annual publication, 1903) contains papers on the following subjects:—(1) On the calculation of lunar distances by the aid of the Mercator functions; (2) estimation of the latitude of Heidelberg Observatory and its variations; (3) the daily variation of the magnetic declination; (4) the wind variation on the German coast; (5) on the "going" of the standard clocks of the German Naval Observatory; (6) the definitive elements of comet 1887 II. (Brooks). In the last named paper Prof. Dr. C. Stechert has reduced a large number of observations collected from various observatories, and has therefrom calculated the following definitive elements and the probable errors for the orbit of Brooks's comet (1887 II.):—

T = 1887 March 17·427594 ± 0·0061984 (M.T. Berlin)
ω = 159° 26′ 15″·00 ± 14″·91
Ω = 279° 56′ 12″·62 ± 3″·54 } Mean equinox 1887·0
i = 104° 16′ 10″·47 ± 3″·18
log q = 0·2122261 ± 0·0000095
e = 0·9836922 ± 0·0002550.

Dr. Stechert's paper is also published in No. 3957 of the *Astronomische Nachrichten*.

AN INTERESTING METEOR TRAIL.—A peculiar meteoric phenomenon was observed by Senor J. A. Perez at Madrid on October 16, 1903. The meteor first appeared in Perseus at about 10 p.m., and the luminous trail did not entirely fade away until nearly 12 p.m. In the meantime its shape varied considerably. Commencing as an almost closed curve with a loop in it, the loop gradually developed until finally the primary curved trail almost entirely disappeared, leaving only a short faint portion entirely separated from the enlarged loop. Six drawings and a description of the phenomenon are published in No. 16 of *Das Weltall*.

THE ROYAL SOCIETY CONVERSAZIONE.

THE second of the two conversaziones held annually at the Royal Society took place on Wednesday, June 22. Many of the exhibits of recent scientific methods and results on view during the evening were shown at the conversazione held in May, and have already been described (May 19, p. 68), but there were, in addition to these, a number of new objects and experiments, of which a list is here given.

Spontaneous electrification of radium: Hon. R. J. Strutt. A specimen of radium salt in a glass tube is hung up by an

insulating support in an exhausted vessel. An electroscope is attached to the radium tube. Negatively electrified particles are shot off by the radium, and penetrate the glass tube, which is covered with a conducting coating of phosphoric acid, so as to act as an inductor. Thus a positive charge is left, and causes divergence. When the electroscope leaf touches the outer vessel, which is earthed, it collapses, and begins to charge up again. This will go on so long as the radium lasts.—Demonstration of oscillating electric discharges: Prof. A. Schuster, F.R.S., and Dr. G. Hemsalech. The separation of the components of a slowly oscillating electric discharge is effected by blowing a steady current of air through it. The discharge passes between two slightly inclined metal plates, and spectroscopic analysis shows the line spectrum of air in the initial discharge and the band spectrum of nitrogen in the oscillations. The metallic vapour from the electrodes does not seem to take part in the oscillations. The effect of introducing cores of iron or other metals into a coil giving self-induction may be illustrated by this arrangement.—The thermo-galvanometer: Mr. W. Duddell. The instrument is intended for the measurement of very small rapidly varying currents such as telephonic currents and the currents produced in the receiving vertical wire in wireless telegraphy. The sensibility of the instrument is such that either direct or alternating currents from a few micro-amperes upwards can be measured.—A new magnetic balance: Mr. W. Hibbert. The beam of a balance is made of a magnetised steel rod 27 centimetres long. The "centres" of the poles are 25 centimetres apart. The repellent pole of a second magnet being placed over one end of the beam causes this to descend, and the force of repulsion is balanced by a weight sliding on the other half of the beam.

Photographs and diagrams illustrating solar and meteorological changes, and a series of photographs to determine the relative temperatures of the stars: Sir J. Norman Lockyer, K.C.B., F.R.S. This exhibit included (1) enlarged pictures of the sun in "K" light taken with the spectroheliograph of the Solar Physics Observatory. (2) Diagrams illustrating the results of a discussion of sun-spot distribution; the relationship between the positions of solar prominences and the different forms of the corona; the different types, and their distribution, of the short-period barometric pressure variation over the earth's surface; and the close connection between the change of barometric pressure and rainfall. (3) Series of photographs taken with a quartz-calcite prismatic camera of 2-inch aperture and 18-inch focal length to determine the relative temperatures of stars. (4) Composite positives on glass of the sun's limb and disc, taken on the same plate with "K" light.—Photographs and drawings prepared from observations taken by the lightning research committee to illustrate the behaviour of lightning on certain buildings struck and damaged, notwithstanding their being provided with lightning conductors: Mr. Killingworth Hedges.—The physiotype: Mr. Francis Sheridan. This is a method of permanent printing without the use of inks, specially adapted to finger printing and the reproduction of designs from animal and vegetable life. The subject to be reproduced is pressed on paper, and by dusting the invisible impression with a coloured powder a dark and permanent print is produced.—Experiment showing the effect of internal stresses in glass upon light of different colours: Dr. L. N. G. Filon.—Photographic camera with free-swinging lens, and photographs taken with it: Dr. W. M. Flinders Petrie, F.R.S.—(1) Photomicrographs of interior of a rifle barrel; (2) photomicrographs of brass used for cartridge cases: Dr. W. R. Hodgkinson and Captain Hardcastle, R.A.

A new automatic vacuum pump: Mr. C. E. S. Phillips. The apparatus consists of a modified Toepler pump, so arranged that it works automatically through the operation of electrically controlled devices, for the purpose of producing extremely high rarefactions. The pump will reduce the gas pressure within a vessel of 200 c.c. capacity from that of the atmosphere to 0·002 mm. in fifteen minutes.—Vibrograph for recording vibrations photographically: the Cambridge Scientific Instrument Company, Ltd. The instrument is essentially similar to that used by Mr. A. Mallock, F.R.S., for recording vibrations caused by traffic on the Central London Railway.—An experiment illustrating harmonic undertones: Mr. H. Knapman.

The origin and growth of ripple mark: Mrs. Hertha Ayrton. The experiments shown illustrated the way in which the sand ripples are formed on the sea shore. If sand be spread quite evenly on the bottom of a trough, and water above the sand be oscillated so as to produce stationary waves, a small ridge is formed where the horizontal velocity of the water is greatest, next a ridge is started on each side of the first, which grows; then two more ridges are started, the former growing, and so on until the whole surface of the sand is ripple-marked. Each ripple now slowly moves towards the place of greatest horizontal velocity, while fresh ripples form near the places of least horizontal velocity. Pairs of ripples then coalesce here and there, and finally the greater part of the sand is assembled in a ripple-marked heap at the places of greatest horizontal velocity, this final result being attained, for example, in about twenty-five minutes in the case of the six-foot trough exhibited, when the stationary wave is twice the length of the trough. It was also shown that ripples are *not* produced by a *steady* current of water flowing over sand, but that by disturbing this steady current sand ripples may be formed, which, however, are erased on the current becoming steady again.

Crystalline glazes on pottery: Mr. William Burton and Mr. Joseph Burton. The specimens illustrated the decorative application to English earthenware and stoneware of certain recently discovered glazes which develop artificial crystalline silicates during the firing and cooling of the wares. In the "sunstone" and "fiery" crystalline glazes the crystals have the optical properties of micas, though their exact composition is at present undetermined. In the starry and opalescent glazes the radiating needles are akin to the mineral willemite, as is shown both by their optical properties and their composition.—Photographs of volcanic phenomena in the Lipari Islands: Dr. Tempest Anderson. The photographs, which were taken by the exhibitor in April of this year, show, besides the topography of the craters, several changes which have taken place in and about them since a former visit in 1888, and also some explosions from the crater of Stromboli which took place while Dr. Anderson was on that mountain.

Mimetic resemblance of the different forms of a single species of butterfly to two or three different models. Seasonal phases of South African butterflies of the genus Precis: Prof. E. B. Poulton, F.R.S. The fact that the non-mimetic male of the South and East African *Papilio dardanus* possesses three different forms of female, each mimetic of a different species of Danaine butterfly, was discovered by Mr. Roland Trimen, F.R.S. Within the last few months this discovery has for the first time been confirmed by breeding. The exhibited specimens, constituting the entire evidence thus obtained, were bred by Mr. George F. Leigh at Durban, Natal. The evidence of the wonderful seasonal changes in South African butterflies obtained by Mr. Guy A. K. Marshall has been further increased during the present year. His recently obtained evidence was exhibited, and consisted of a wet-season female of *Precis antilope* with its five dry-season offspring.—Colour photographs (Sanger-Shepherd process) of living moths and butterflies in their various stages of larva, pupa and imago: Mr. F. Enock.—(1) Living specimens of young flatfish; (2) methods of determining the age of plaice; (3) charts illustrating the natural history of the plaice in the North Sea; (4) charts illustrating the plankton and hydrography of the English Channel during 1903: the Marine Biological Association.—The cilioscribe, a machine to record the movements of cilia and the effect of physical conditions and chemical reagents upon them: Dr. W. E. Dixon and Mr. O. Inchley.—Specimens of West Indian fire-flies: the Zoological Society of London.

Photography of the movements of plants by means of the kammatograph: Mrs. D. H. Scott. The photographs are taken at intervals varying according to the rapidity of the movements of the plants during several days, and sometimes weeks. They are then shown on the screen in the kammatograph, and the movements of many days can be followed in a few seconds.—Models to illustrate the reduction (heterotype) divisions in animals and plants: Prof. J. B. Farmer, F.R.S., and Mr. J. E. S. Moore.

(1) Model of the external door of the Great Pyramid; (2) ellipsograph: Mr. R. Inwards.